

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of:	§	
LUBOMIRSKY, et al.	§	
	§	Group Art Unit: 1753
Serial No.: 10/781,040	§	
	§	
Confirmation No.: 8367	§	
	§	Examiner: Luan V. Van
Filed: February 18, 2004	§	
	§	
For: METHOF FOR IMMERSING	§	
A SUBSTRATE	§	

MAIL STOP APPEAL BRIEF-PATENTS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

REPLY BRIEF

Applicants submit this Reply Brief to the Board of Patent Appeals and Interferences in response to the Examiner's Answer dated November 9, 2006. Please charge any additional fees that may be required to make this Reply Brief timely and acceptable to Deposit Account No. 20-0782/APPM/008266/KMT.

ARGUMENTS

A. Rejection of Claims 25 under 35 U.S.C. §112, first paragraph.

Claim 25 stands rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. The Examiner states that the disclosure does not provide a clear indication to support the limitation of “the anode is not tilted” in claim 25. Applicants respectfully request withdrawal of the rejection of claim 25 under 35 U.S.C. §112, first paragraph.

Applicants respectfully submit that the limitation of “the anode is not tilted” in claim 25 is supported at least at paragraphs 26 and 28. For example, the specification describes “stations 102, 104, 110, and 112 may be configured as plating cells, either electrochemical plating cells or electroless plating cells, for example” (see, paragraph 26), “the exemplary plating cell and the above noted components are further illustrated in commonly assigned United States Patent Application Serial No. 10/268,284,..... incorporated herein by reference in their entireties to the extent that these applications are not inconsistent with the present invention” (see, paragraph 28). Further, paragraph 24 of Patent Application Serial No. 10/268,284, states that “plating cell 100 may be horizontally positioned or in a tilted orientation”. Thus, the Specification supports that electrochemical plating cells, electroless plating cells, and components therein are positioned either horizontally in general or, in some cases, a desired tilted orientation. Further, as supported by the Specification, components in electrochemical plating cells and electroless plating cells are positioned either horizontally or tilted at an angle together as a whole. For example, the plating cell and the components therein (e.g., an anode) can be positioned horizontally. As another example, the plating cell and the components therein (e.g., an anode) is positioned in a tilted orientation. Furthermore, as supported by paragraph 28 of the specification, the exemplary plating cell and the above noted components may be horizontally positioned, and thus supports the limitation of “the anode is not tilted”, as recited in claim 25.

B. Rejection of Claims 1-4, 8-9, 12-16 and 20-26 over *Dordi, et al.* in view of *Sendai, et al.*

Claims 1-4, 8-9, 12-16 and 20-26 stand rejected under 35 U.S.C. § 103(a) as being obvious over *Dordi, et al.* in view of *Sendai, et al.* The Examiner states that *Dordi, et al.* teaches a first tilt angle and a second tilt angle being maintained in a horizontal position which is different from the first tilt angle. The Examiner also states that *Dordi, et al.* does not explicitly disclose a processing angle but the second tilt angle of *Dordi, et al.* is the same as the processing angle since the anode of *Dordi, et al.* is not tilted. The Examiner further states *Dordi, et al.* does not teach positioning a substrate parallel to the surface of the anode whereas *Sendai, et al.* teaches the substrate and the anode are parallel to each other in a tilt processing angle of one to ten degrees, and it would have been obvious to have modified the method of *Dordi, et al.* by tilting the substrate and the anode to the processing angle of *Sendai, et al.* because it would prevent air bubble from remaining on the surface to be plated, thus preventing defects in the plated films, and the teachings of paragraph 96 of *Sendai, et al.* provide a motivation for modifying the processing angle of *Sendai, et al.* Applicants have respectfully traversed the rejections based on failure of *Dordi et al.* in view of *Sendai et al.* to teach or suggest that a substrate to be held at three angled positions, a first tilted angle during displacing a receiving member loaded with the substrate toward a fluid solution, a second tilted angle when the substrate contacts the fluid solution, and a third tilted angle parallel to a surface of an anode during processing of the substrate.

Dordi et al. discloses a plating method of immersing a substrate into a horizontal plating cell by vertically displacing the substrate into an electrolyte solution while maintaining the substrate at a tilt angle above the electrolyte solution and positioning the substrate substantially horizontal prior to plating a material on the substrate. Thus, *Dordi et al.* discloses the substrate being held at two positions, a first tilted/angled position and a second horizontal position.

Sendai et al. discloses a method of immersing the wafer (W) into a plating bath 12 having an anode 17, depending on the anode 17 is placed/positioned horizontally or

tilted. When the anode 17 is placed horizontally, the wafer is held at two positions, a first inclined angle of α and then a horizontal processing position. (See, Figures 1-9, paragraphs 0022-0025, and 0080-0087.) Thus, the wafer of *Sendai et al.* is being held at two positions when the anode is not tilted. When the anode 17 of *Sendai et al.* is inclined at a fixed angle of β , the wafer is held at only one single position, which is the same fixed angle of β . In this instance, *Sendai et al.* teaches that the wafer does not need to be brought back to horizontal during both immersion and plating processes since the wafer and the anode 17 are tilted at the same inclined angle of β . (See, Figures 11-12 and paragraphs 0091-0096.) Thus, the wafer of *Sendai et al.* is being held at one single position when the anode is tilted.

Thus, *Dordi et al.* in view of *Sendai et al.* discloses that the substrate is held at a first tilt angle and a horizontal processing position in a horizontal plating cell, or alternatively, in a plating cell with a tilted anode, the substrate is held at a fixed tilt angle without the need to change the angle of the substrate during immersion and processing. Applicants respectfully submit that there is no teaching, suggestion, or motivation in the references for the substrate to be held at three angled positions. *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show, or suggest tilting a receiving member and positioning a substrate to a first tilt angle, a second tilt angle, and a processing angle, as recited in claims 1, 8, 15, 23, and claims dependent thereon.

Accordingly, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for immersing a substrate into a fluid solution having an anode placed therein, including loading a substrate into a receiving member, tilting the receiving member to a first tilt angle measured from horizontal, displacing the receiving member toward the fluid solution at the first tilt angle, tilting the receiving member to a second tilt angle measured from horizontal when the substrate contacts the fluid solution, the second tilt angle being different from the first tilt angle, and positioning the substrate at a processing angle such that a plating surface of the substrate is positioned substantially parallel to a surface of the anode placed in the fluid solution, wherein the anode is tilted between about 3° and about 30°, as recited in claim 1 and claims dependent thereon.

In addition, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show, or suggest vertically actuating a substrate toward a fluid solution having an anode placed therein while maintaining the tilt angle, reducing the tilt angle to about horizontal once the substrate contacts the fluid solution, while continuing the vertical actuation of the substrate, and positioning the substrate at a processing angle. Thus, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for minimizing bubble adherence to a substrate during a substrate immersion process, including tilting the substrate to a tilt angle measured from horizontal, vertically actuating the substrate toward a fluid solution having an anode placed therein while maintaining the tilt angle, reducing the tilt angle to about horizontal once the substrate contacts the fluid solution, while continuing the vertical actuation of the substrate, and positioning the substrate at a processing angle such that a plating surface of the substrate is positioned substantially parallel to a surface of the anode placed in the fluid solution, wherein the anode is tilted between about 3° and about 30°, as recited in claim 8 and claims dependent thereon.

Further, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show, or suggest reducing the tilt angle to about horizontal when the contact ring initially touches the plating electrolyte. Thus, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for immersing a substrate into a plating electrolyte having an anode placed therein, including positioning the substrate on a contact ring, securing the substrate to the contact ring with a thrust plate assembly, tilting the contact ring to a tilt angle of between about 3° and about 7°, vertically actuating the contact ring toward the plating electrolyte while maintaining the tilt angle, rotating the contact ring at a rotation rate of between about 30 rpm and about 120 rpm, reducing the tilt angle to about horizontal when the contact ring initially touches the plating electrolyte, and positioning the substrate in a processing position such that a plating surface of the substrate is positioned substantially parallel to a surface of the anode placed in the plating electrolyte, wherein the anode is tilted between about 3° and about 30°, as recited in claim 15 and claims dependent thereon.

Still further, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show, or suggest pivoting a receiving member while maintaining the substrate

immersed. *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show, or suggest the substrate being held at a first tilt position, an intermediate tilt position, a second tilt position, and a third tilt position. Thus, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for immersing a substrate into a plating solution contained in a plating cell of a plating apparatus, the plating cell having an anode placed therein, including loading a substrate into a receiving member of the plating apparatus, tilting the receiving member to a first tilt angle relative to a surface of the anode, immersing the substrate into the plating solution of the plating cell, pivoting the receiving member from the first tilt angle through an intermediate position to a second tilt angle while maintaining the substrate immersed in the plating solution, wherein at the intermediate position the surface of the substrate is substantially parallel to the surface of the anode, and tilting the substrate being held by the receiving member from the second tilt angle into a third tilt angle such that a plating surface of the substrate is positioned substantially parallel to the surface of the anode, as recited in claim 23 and claims dependent thereon.

Withdrawal of the rejection is respectfully requested.

C. Rejection of Claims 5, 6, 10, and 19 under 35 U.S.C. § 103(a) as being obvious over *Dordi, et al.* '578 in view of *Sendai, et al.*, and further in view of *Wang et al.*

Claims 5, 6, 10, and 19 stand rejected under 35 U.S.C. § 103(a) as being obvious over *Dordi, et al.* '578 in view of *Sendai, et al.*, and further in view of *Wang et al.* Applicant have respectfully traversed the rejection.

Dordi et al. and *Sendai et al.* have been discussed above.

Wang et al. discloses an electro-chemical plating system and a plating method. *Wang et al.* does not disclose tilting a receiving member and positioning a substrate to a first tilt angle, a second tilt angle, and a processing angle, as recited in claims 1, 8, 15, which claims 5, 6, 10, and 19 are dependent on, and lacking in *Dordi et al.* in view of *Sendai et al.* In addition, *Dordi et al.* in view of *Sendai et al.*, and further in view of *Wang et al.*, alone or in combination, does not teach, show or suggest tilting the receiving member to a second tilt angle measured from horizontal when the substrate contacts

the fluid solution, as recited in claim 1 and claims dependent thereon, or once the substrate contacts the fluid solution, as recited in claim 8 and claims dependent thereon, or when the contact ring initially touches the plating electrolyte, as recited in claim 15 and claims dependent thereon.

Therefore, *Dordi et al.* in view of *Sendai et al.*, and further in view of *Wang et al.*, alone or in combination, does not teach, show, or suggest the substrate being held at three tilted angles in addition to oscillating the second tilt angle of the substrate once the substrate is immersed in the fluid solution, oscillating the substrate in a vertical direction once the substrate is immersed in the fluid solution, before positioning the substrate at the processing angle, or after the tilt angle is reduced to about horizontal, as recited in claim 5, 6, 10, and 19, respectively. Withdrawal of the rejection is respectfully requested.

CONCLUSION

The Examiner errs in finding that the limitation in claim 25 is not supported to reject claim 25 because the limitation of "the anode is not tilted" in claim 25 is supported by the disclosure of the instant application.

The Examiner errs in finding that *Dordi et al.* in view of *Sendai et al.* discloses a substrate being held at three tilted angles during substrate immersion to reject claims 1-4, 8-9, 12-16 and 20-26 because *Dordi et al.* in view of *Sendai et al.* does not teach, show, or suggest an apparatus that holds a substrate at three tilted angles.

The Examiner errs in finding that *Dordi et al.* in view of *Sendai et al.*, and further in view of *Wang et al.* discloses the substrate being held at three tilted angles and oscillating the substrate to reject claims 5, 6, 10, and 19 because *Dordi et al.* in view of *Sendai et al.*, and further in view of *Wang et al.*, alone or in combination, does not teach, show, or suggest the substrate being held at three tilted angles during substrate immersion.

Respectfully submitted,



Keith M. Tackett
Registration No. 32,008
Patterson & Sheridan, L.L.P.
3040 Post Oak Blvd. Suite 1500
Houston, TX 77056
Telephone: (713) 623-4844
Facsimile: (713) 623-4846
Attorney for Appellant(s)